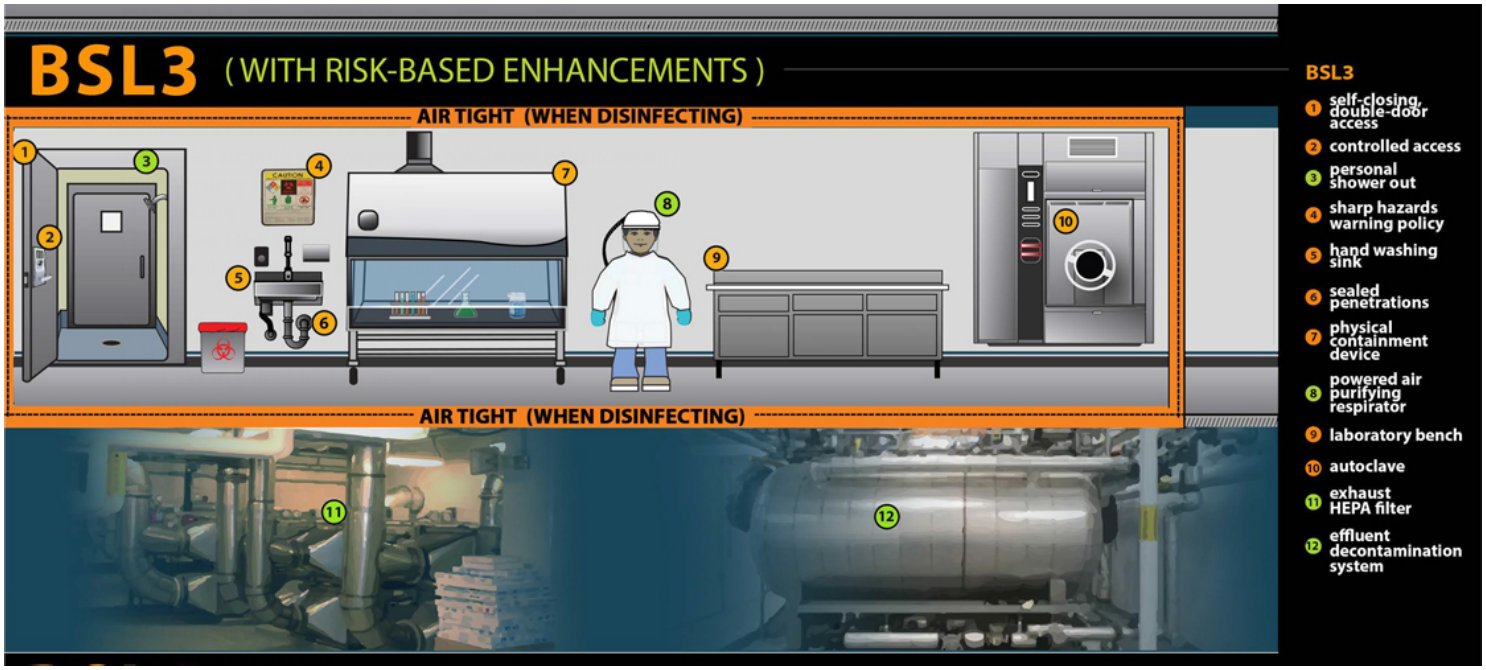


BIOLOGICS

Mar 31, 2021 |
Mary Parker (/eureka/author/mparker)

What is a BSL-3 (Biological Safety Levels) Lab?

Decoding the terms for containing germs

*NOTE: This article is also available in another language (**한국어 (/eureka/what-bsl-3-lab-korean)**).*

Anyone who has seen movies like *Outbreak* or *The Andromeda Strain* could be forgiven for assuming that germs are constantly plotting to escape from labs to wreak havoc on the world. Not surprisingly, that is not the case. The US Centers for Disease Control and Prevention (CDC) sets Biological Safety Levels (BSL) for labs, ranging from 1-4, least to most secure.

Although the trappings of BSL-4 labs are most popular for movies (full body, air-

supplied suits, showers before exiting, etc.) these are relatively rare. Level 4 labs are for the deadliest, least treatable viruses, like Ebola and Marburg.

A **Charles River site in Ballina, Ireland (/products-services/biologics-testing-solutions/biologics-testing-manufacturing-facilities/ballina-ireland)** recently upgraded to BSL-3 status. This level is the standard for microbes that can cause serious or deadly diseases through inhalation – like COVID-19. While BSL-2 labs are safe enough for serious viruses like HIV and *Staphylococcus aureus*, BSL-3 level labs are required for potentially airborne diseases.

“In Ballina we had a facility that we considered BSL-2+,” said Amro Elabbas, Head of Operations for Microbiology and Bioassay in Ballina. “It had a shower into the area, full gowns, respirators, and we used individually ventilated cages and biological safety cabinets. What we needed to do is just add some additional security and air circulation upgrades.”

Each BSL level builds on the one below it. For a standard BSL 1 lab, that involves things like hand washing stations, policies for handling sharp objects like needles, and standard PPE like gloves, lab coats, and safety glasses as needed. Level 2 introduces controlled access and special equipment, like biological safety cabinets (BSC). For BSL-3, Ballina needed to add special security like double door access, more PPE, and HEPA filters.

“Probably our major cost was making sure that the entire building was HEPA filtered. Any air that's exiting the facility, we have to be sure it's clean so that we don't contaminate the environment,” Elabbas said. “We were lucky in that we already had air handling units that supplied HEPA filtered air in, so it was just a case of upgrading the exhausted air.”

When working with dangerous, potentially airborne microbes, there are several layers of HEPA filters between the material and the outside world. First is the BSC, a large enclosed station that protects a researcher with glass and filtered air from the material they are working on. Second is the filters between the entire lab and the rest of the building, and finally the filters between the building and the

outdoors.

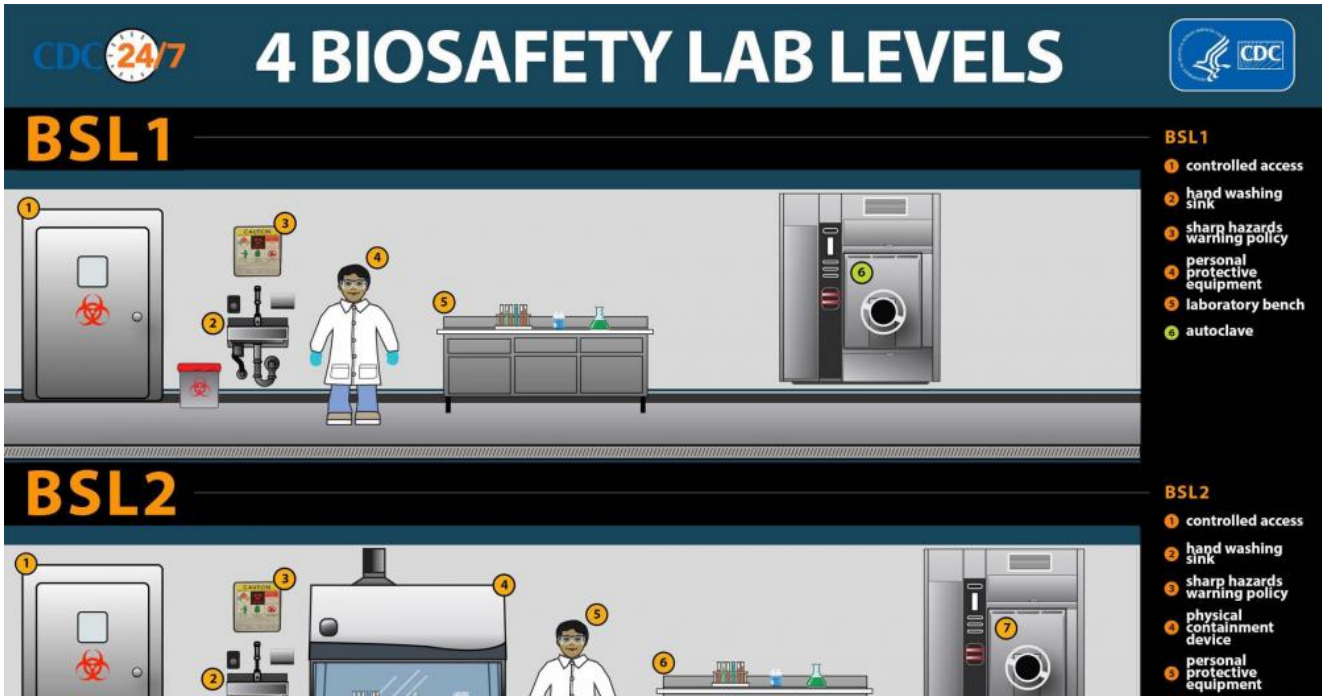
Elabbas says that several common viruses need to be handled in BSL-3 labs, like some strains of influenza or tick-borne encephalitis. The upgrade also expands the kinds of assays the lab can run, which comes in handy for testing COVID vaccines.

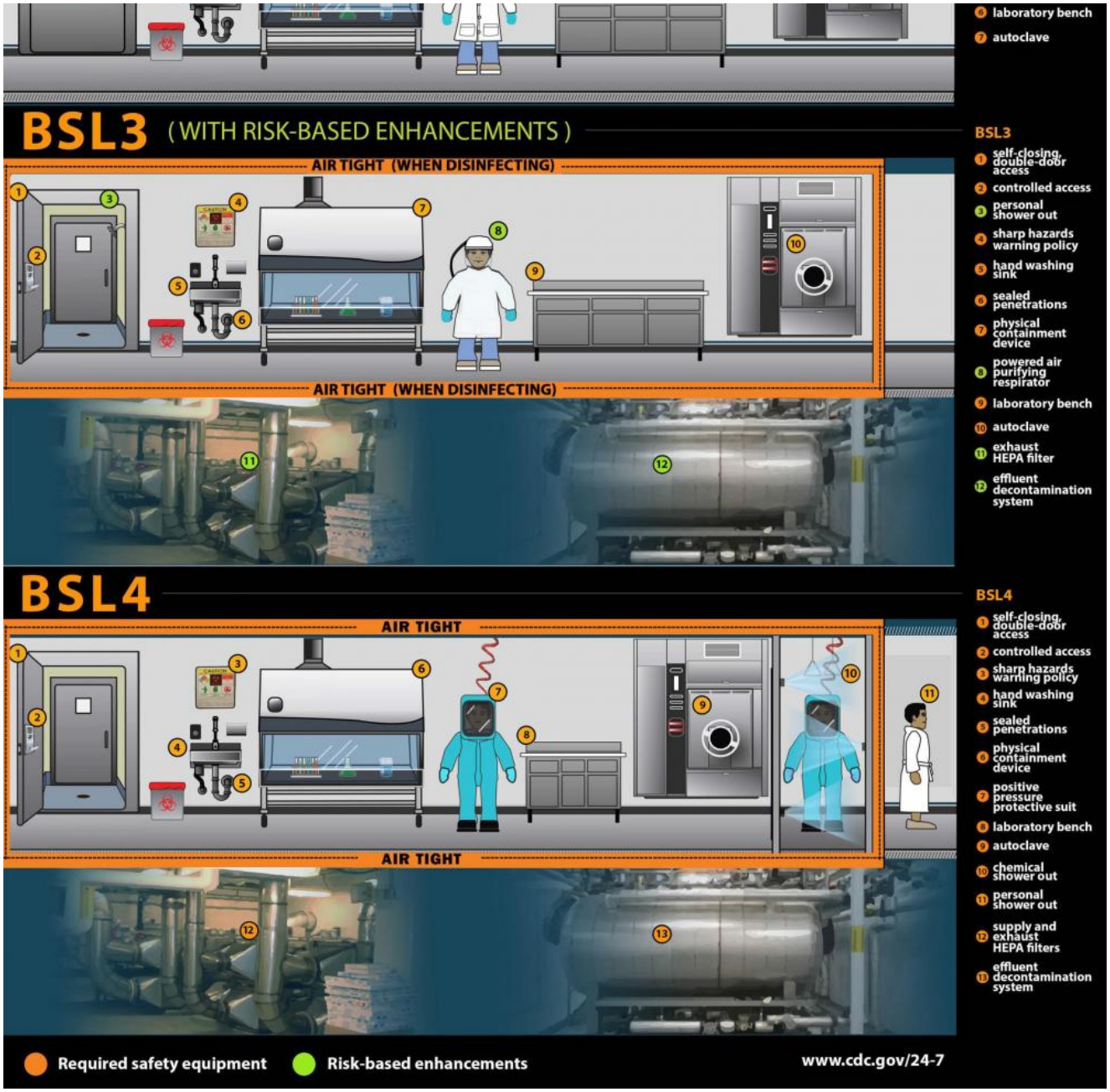
Finally, the technicians themselves will get an upgrade in training. Along with new equipment and new PPE requirements comes special training to handle the more dangerous pathogens.

“The most important training of all is how to dispose of the actual sample,” Elabbas said. “That's where the challenges are going to come from. It's going to be difficult. It's going to be costly. It's doable, but that's the focus of a lot of the training we'll have to go over the next couple of months.”

Disposal of BSL3 samples is more complex than lower BSL levels since they must ensure that the pathogens are inactivated prior to leaving the facility. These inactivation processes must be validated, and the procedures must be followed stringently. Inactivation of pathogens is achieved either chemically, mechanically (i.e. autoclaved) or by using a combination of both methods.

How are Biological Safety Levels Determined?





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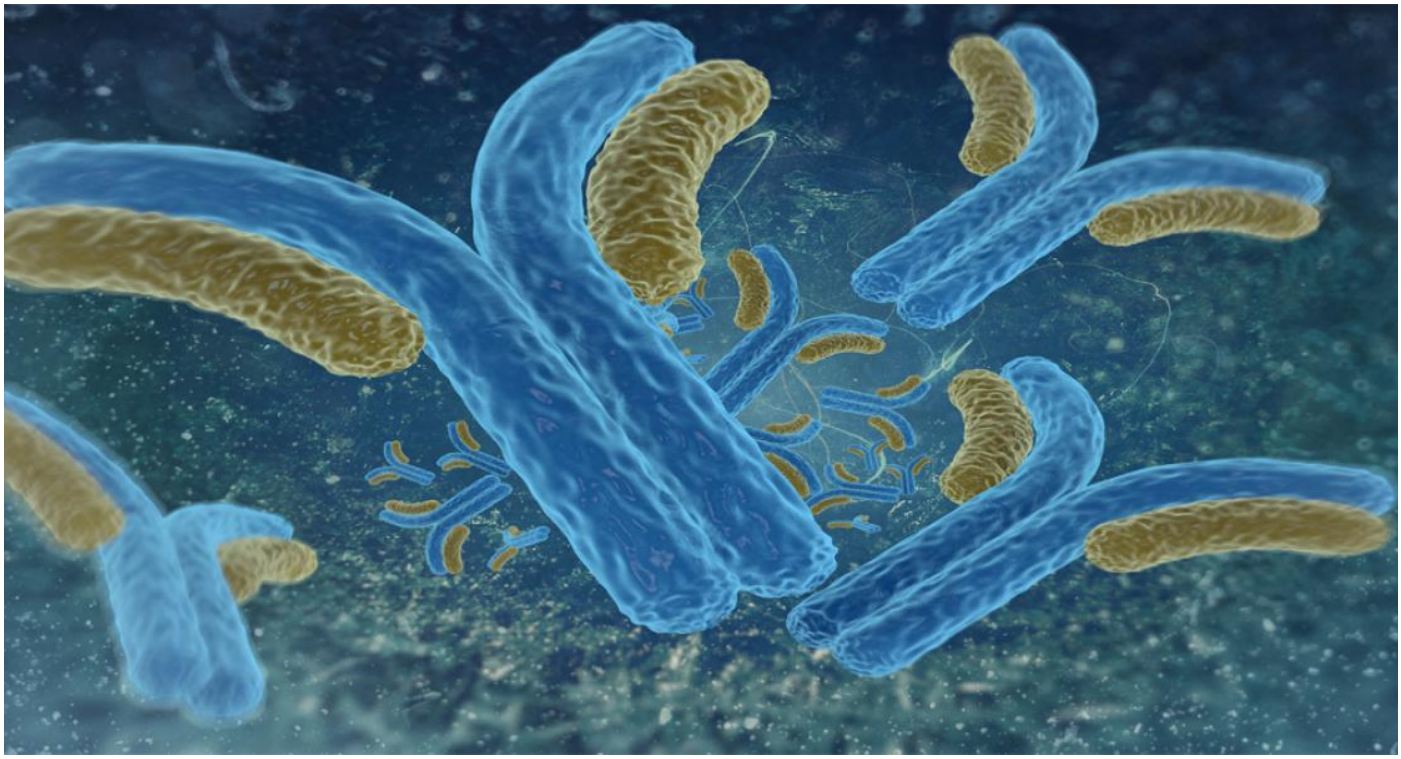

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